Environmental and Social Impact Assessment
Executive Summary

For

URUMQI DISTRICT HEATING PROJECT

EA Center of the Xinjiang Uyghur Autonomous Region

March 11, 2011

TABLE OF CONTENT

1. INTRODUCTION

1.1 Project Background

The city of Urumqi, the capital of Xinjiang Uygur Autonomous Region in westernmost China, is experiencing rapid urbanization and economic growth, which poses challenges to Urumqi Municipal Government in providing adequate and efficient public services while cost-effectively controlling environmental pollution. Urumqi has been suffering serious air pollution in winter season, primarily caused by intensive use of coal in industrial sector and space heating.

In order to improve air quality, the Urumqi Municipal Government has proposed a series of initiatives for clean air in the city. The Urban Heating Plan (the "Plan" hereafter) is one of the action plans among the initiatives, which calls for promoting expanded use of CHPs and larger district heating networks to replace those smaller heating networks, and phased adoption of natural gas to replace coal. This project consists of construction and rehabilitation of district heating system supplied by CHP in two urban districts of Urumqi. This project is an integral part of the Plan and has been proposed by Urumqi Municipal Government for partial financing from the World Bank (WB).

This project has been classified into Category A according to the WB safeguard policy requirements. An Environment Assessment (EA) was conducted for each physical component by the EA Center of the Xinjiang Uyghur Autonomous Region. A Social Impact Assessment (SIA) has been prepared by Xinjiang Social and Science Academy Institute for this project. This document is a summary of the EA and the SIA document.

1.2 Environmental Policies, Laws and Regulations

1.2.1 Laws and Regulations

The basis of the EIA Reports includes national and local environmental laws, regulations, policies, and the World Bank's environmental and social safeguard policies. The main applicable laws and regulations include:

Environmental Protection law of the People's Republic of China, 1989

The Law on the Prevention and Control of Atmospheric Pollution, 2000

The Law on Prevention and Control of Water Pollution, 2008

The Law on Prevention and Control of Pollution From Environmental Noise, 1996

The Law on Environmental Impact Assessment, 2003

Technical Guideline for Environmental Impact Assessment; and various applicable standards for air, water, and noise.

1.2.2 Applicable Standards

The most important assessment criteria and environmental quality standards are the Ambient Air Quality Standard (see Table 1-1) which classifies the air quality into three classes for areas zoned for different functions, as follows:

Class I: applicable to natural reserves, scenery spots or other sites requiring special protection;

Class II: applicable to residential areas, composite areas for residential and commercial activities, normal industrial and rural areas; and

Class III: applicable to special designated industrial zones.

Table 1-1 Ambient Air Quality Standard (GB3095-96) Unit: mg/m³

Pollutant	Sampling time	Concentration limit (GB3095-96)		
		Class I	Class II	Class III
SO_2	Annual average	0.02	0.06	0.10
	Daily average	0.05	0.15	0.25
	Hourly average	0.15	0.50	0.70
PM_{10}	Annual average	0.04	0.10	0.15
	Daily average	0.05	0.15	0.25
$N0_2$	Annual average	0.04	0.08	0.08
	Daily average	0.08	0.12	0.12
	Hourly average	0.12	0.24	0.24

Table 1-2 Other Applicable Standards

Category	Name of standard
Environment quality standard	Surface Water Quality Standard (GB3838-2002)
	Acoustic Environment Quality Standard (GB3096-2008)
Pollutant discharge standard	Discharge Standard for Municipal Wastewater (CJ 3082-1996)
	Noise Limits on Boundaries of Construction Sites (GB12523-90)
	Noise Standard on Boundaries of Enterprises (GB12348-2008)

In addition, World Bank safeguard policy OP 4.01 Environmental Assessment has been triggered and applied in the EIA process and incorporated in EIA reports. As all of the proposed substations will be constructed within the site boundary of the existing boiler plants or the state-owned land, no permanent acquisition of collective-owned land is needed; the proposed pipelines will be constructed under roads, no need for temporary land occupation. The safeguard policy OP 4.12 Involuntary Resettlement is triggered because of the possibility of modification of pipeline alignment that would require land occupation and/or resettlement.

1.3 Assessment Scope, Period and Key Issues

The scope and key objects of environmental assessment are shown in Table 1-3.

Table 1-3 Assessment Scope

No.	Environmental Factor	Assessment Scope	Protected Objects
1	Ambient air	The surrounding areas of heating pipeline network; Areas in 200 m radius from pressure isolation, and heat exchange substations	The residential, education and working areas, e.g., government agencies, research and education institutions, schools, hospitals, sanitarium, resorts and office buildings, etc.
2	Surface water environment	Sections 100m upstream and 500m downstream of river crossing heating pipeline	Surface water system and artificial canals.
3	Acoustic environment	Areas 200m away from heating pipelines; Areas in 100 m radius of pressure-isolation and heat exchange substations	The residential, education and working areas, e.g., government agencies, research and education institutions, schools, hospitals, sanitarium, resorts and office buildings, etc.
4	Ecological environment	Areas 200 m from heating pipelines	Natural and artificial greens, parks, attractions, and orchards.
5	Social issues	Area 100 m from the heating pipelines; Areas in 100 m radius of pressure isolation and heat exchange substations or beyond when required.	Social and economic zones in affected areas, e.g. institutes, enterprises, residential areas, cultural sites and education areas, hospitals and commercial areas.

2. PROJECT DESCRIPTION

2.1 Project Composition

The project is intended to connect consumers to district heating services with improved energy efficiency and environmental performance in two districts, Shayibake, Shuimogou and small part of Tianshan District in Urumqi (see Figure 1). The constituents of the project are summarized in Table 2-1 below.

Table 2-1 Project Description

Component	Description	Service Scope	Cost Estimate
Component A: Shuimogou District Urumqi CHP Power Plant Heating	Construction of : -55 km of primary and secondary pipeline -1 pressure isolation station; -46 new heating substations; - -1 metering station at CHP;	14.73 million m^2 with 5.93 million m^2 new planned heating area	USD 196.8 million with USD 56.14 million to be financed by the

Network	-1 dedicated monitoring & dispatch system and control center; Rehabilitation of 45 substations;	by 2015	IBRD
Component B: Shayibake and Tianshan District CHP Heating Network	Construction of: -39 km of primary and secondary pipeline -1 pressure isolation station; -22 new heating substations; --1 heat metering station at CHP; -Rehabilitate 28 substations	14.74 million m^2 with 3.35 million m^2 new planned heating area by 2015	USD 145 million with USD 42.6 million to be financed by the IBRD
Component C: Institutional Development and Project Management Support	Technical assistance, training, study tours and project management support	-	USD 1.27 million with USD 1.01 million to be financed by the IBRD

2.2 Heating Source

Two existing CHPs will supply heat to the project networks with peak load to be satisfied by three existing heat-only boilers (HOB), all using coal-firing boilers. A Due Diligence Review was carried out for these heating sources during the EA preparation and the main conclusion is that these facilities are compliant with national and local emission standards as well as with those of the WB/IFC Environmental Health and Safety (EHS) guidelines, as described in Chapter 8.

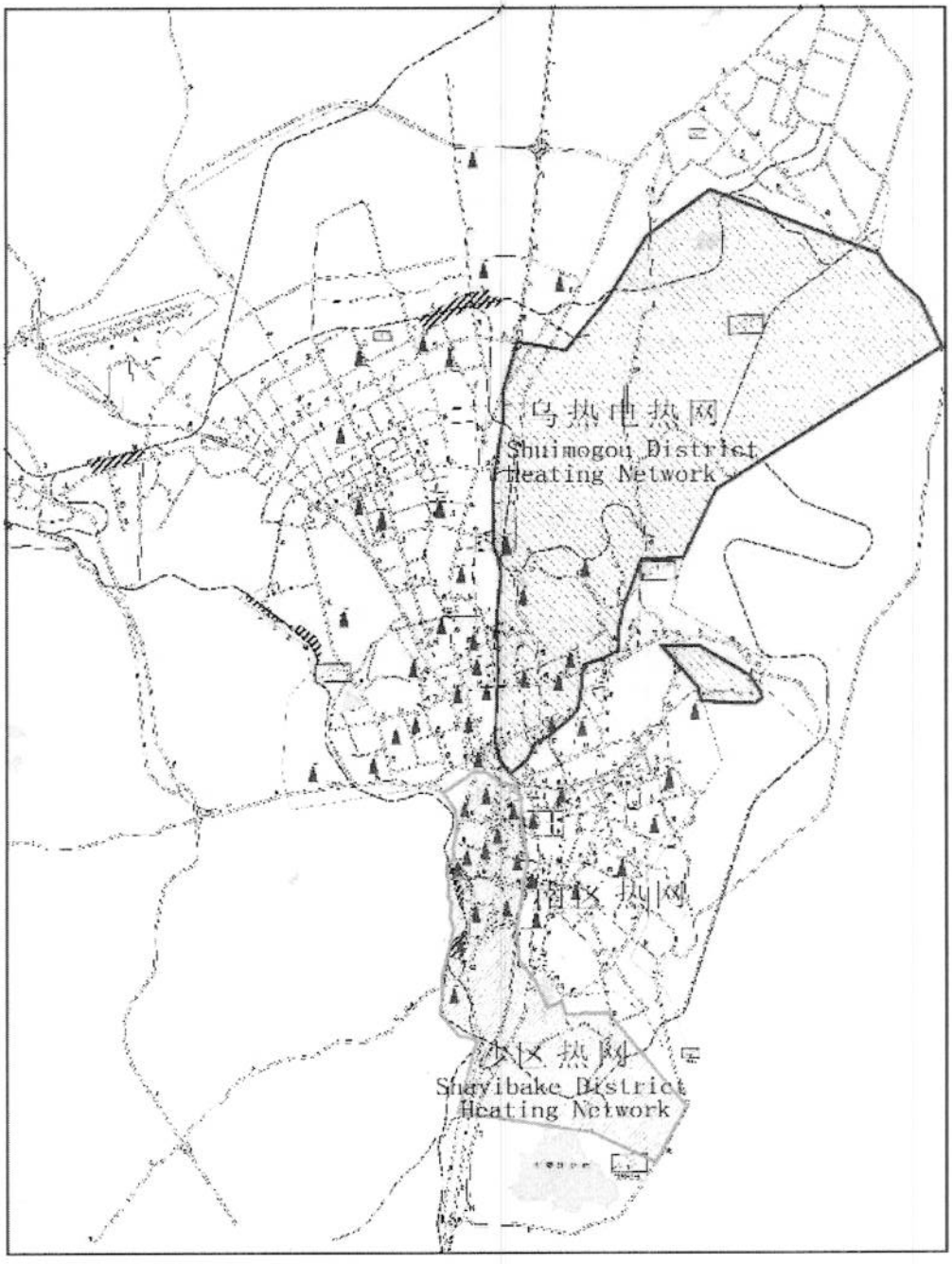

Figure 2.2-1 The heating area

3. ENVIRONMENTAL BASELINE

3.1 Geographic and Climatic Condition

Both of the two physical components of the project are located in Urumqi city, the capital of Xinjiang Uygur Autonomous Region. It is located on a plateau within the range E 86°37′ 33″ to E88°58′ 24″and N42°45′ 32″ to 44°08′ 00″. The city of Urumqi covers an area of 14,206km^2 with 302.8km^2 built up area. Urumqi City is surrounded by mountains on all sides except for an open alluvial plain on the north. It slopes from southeast to the northwest with an average ground elevation of 800m.

Urumqi City is located in the central part of Eurasia and far from the sea, where the arid continental climate dominates. The climate is characterized with distinct seasons, spring is dry and windy, summer is hot with less rainfall, autumn is mild and cool, and winter is cold with less snow. Days with calm wind and temperature inversion is prevailing in winter, leading to a very poor condition for the dispersion of the atmospheric pollutants. The annual average temperature is 6.1°C, the annual average precipitation is 277.6 mm and annual average evaporation is 2266.0 mm.

3.2 Surface Water Quality

There are 5 river systems in the city of Urumqi. The Component A will cross the Shuimo River and the Component B will cross the Heping Canal. The Central Environmental Monitoring Station of Urumqi carried out a surface water quality monitoring program in August 2009 in the Heping Canal and the Shuimo River respectively. The monitoring results show that the water quality in the two streams is polluted, even in some sections exceeding the Class V of Surface Water Quality Standard, the lowest requirement for beneficial use of surface water.

3.3 Acoustic Environmental Quality

The primary source for noise is the traffic as the project is located in an urban setting. Xinjiang Monitoring Station carried out an acoustic quality monitoring program in 2010 on the selected sites for construction of substation and potential sensitive receptors under the project. The monitoring results show that the current acoustic quality in the selected sites is fairly good and meet the Acoustic Quality Standard of China

3.4 Ambient Air Quality

The ambient air is seriously polluted in the city of Urumqi. The routine air quality monitoring data, provided by the Central Environmental Monitoring Station of Urumqi in 2009, indicate that the results on annual average basis for all of the 9 regular sampling points in the city exceed the Class II of the Ambient Air Quality Standard. The monitoring data also show a variation of air pollutants concentration in different seasons, as shown in Table 3-1 below.

Table 3-1Air Pollutants Concentration in Different Seasons in 2009 Unit: mg/m^3

Item	SO_2	PM_{10}	NO_X
Class II of Ambient Air Quality Standard	0.060	0.100	0.080
Annual average	0.093	0.140	0.068
Non-heating season	0.026	0.079	0.052

Heating season	0.159	0.202	0.085

Such seasonal variation of air pollutants concentration indicates that the air pollution in heating season is much more serious than in non-heating season. It is primarily caused by the use of coal for space heating, compounded by calm wind and temperature inversion that often occur in winter.

3.5 Current Status of Heating Service and Air Pollution Control

In Urumqi, the area serviced by CHP and clean energy heating currently accounted only for 20% of the total heating area. The rest were supplied through centralized heating or small coal-fired heating boilers and small coal-fired stoves, as shown in Table 3-2 below.

Table 3-2 Space Heating in Urban Area of Urumqi in 2008 (million m^2)

CHP	Centralized coal-fired boilers	dispersed coal-fired boilers	Small coal - fired stoves	Clean energy	Total
13.	55.94	8.46	13.83	6.50	97.73
13.3%	57.2%	8.7%	14.2%	6.7%	100%

Coal is the fundamental energy source for Urumqi, offering 73% of total energy consumed in the city. In 2008, the total coal consumption was 14.72 million ton, two thirds of which were used in winter. The coal consumption per capita was 3.96 ton, ranking first in China and 4 times as high as the national average. The primary source for air pollution is industrial sector, which consumed 77% of the total coal in 2008, whereas heating consumed 20% of coal.

However, the severe air pollution in winter is recognized to be associated with coal firing for space heating. The centralized coal-fired boilers serviced 57.2% of the total heating area in the city, its share of annual SO_2 load was only 10.9% and annual PM_{10} load was 15.2% respectively in 2008. Although the small coal-fired boilers that are often used for smaller district heating networks and small coal-fired stoves, which are seldom installed with effective flue gas control devices, serviced only 23% of the total heating area, they contributed 40% of atmospheric concentrations of SO_2, PM_{10} and NO_x respectively in the heating season of 2008.

In order to control air pollution caused by coal combustion in winter, the city issued its local standard "Emission Standard of Air Pollutants for Coal-fired Boiler" (DB65/2154-2010) and implemented since 2010. Its standard on dust and SO_2 is stricter than the national standards for Boilers (GB13271-2001) and comparable to that of the WB/IFC's EHS Guidelines., as shown in Annex 1 (Table 1-2).

As part of the effort to improve energy supply and heating system in Urumqi and reduce coal based air emissions, the government proposes to use centralized heating through CHP, to develop clean energy such as gas heating and to promote energy saving strategy. The target is to enhance CHP and clean energy use to 90% by 2015.

The government also plans to replace existing coal-fired substations and small coal-fired boilers with CHP and natural gas-based heating systems. Natural gas boiler is proposed to be used for peak balancing of the CHP system and in areas that cannot be reached by CHP.

3.6 Respiratory Disease Status

The typical harm of air pollution to human health is respiratory diseases and physiological dysfunction. The statistical information for respiratory disease year around in some hospitals in Urumqi is given in Table 3-3 below.

Table 3-3 Outpatients of Respiratory Disease in Some Hospitals in Urumqi (2002-2005)

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Oct.	Nov	Dec.
Monthly mean	2079	1476	1549	1926	1701	1545	1506	1778	1669	2220	2179

The data shows that the number of outpatients of respiratory disease reached the peak in November, December and January. Except for factors like weather change, atmospheric pressure increase and sudden drop of temperature, air pollution in heating season in winter is the main cause of the increased outpatients of respiratory diseases in Urumqi. In contrast, the number of outpatients of respiratory diseases decreased in spring and summer when air quality improved.

3.7 Social and Economic Status

Urumqi is the capital city of Xinjiang Uygur Autonomous Region covering seven districts and one county. Urumqi City has the most complex composition of ethic groups in China. There are 49 ethnic groups such as Uygur, Han, Hui, Kazak and Mongolian. The total population is 2.082 million, 24.6% of which are ethnic minorities. About 83.5% of the people are in urban area. As the capital city of Xinjiang Uygur Autonomous Region, Urumqi has the largest total industrial output and strongest development potential in the region. The GDP of Urumqi is RMB 109.5 billion in 2009, accounting for more than 25% of the total of Xinjiang Uygur Autonomous Region. On constant price, the increase rate of GDP is 15% in 2009.

3.8 Key Environmentally Sensitive Receptors

Environmentally sensitive receptors of the project mainly include mosques, schools, hospitals, residential communities and streams. The impact of primary concern is the noise which would disturb the daily life or work of the people in proximity.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Impact Assessment in Construction Phase

Potential adverse impacts of the project during construction are summarized in Table 4-1.

Table 4-1 Impacts in Construction Phase

No.	Issue	Negative impacts
1	Air-borne dust	It will be generated from trench excavation, construction of substations, in the process of material transportation and disposal. The affected area is the area within 150 m from the construction sites.
2	Construction wastewater	It will be generated from the connection with existing pipeline and the pressure test process. The wastewater has very weak pollution strength

		and has minor impact to the environment.
3	Surface waster	The water quality in the Heping Canal and Shuimo River will be polluted during the construction of crossing pipeline by disturbance of sediments.
4	Noise	Construction and transport vehicles would have potential impacts on sensitive points, especially hospitals and schools. The affected area is the area within 100 m from the construction sites.
5	Cultural relics	Construction of pipeline can affect religious activities in mosques along roads. Cultural and Religion Bureau confirmed the mosques are ordinary venues for religious activities and no cultural relics in the project area.
6	Spoil and wastes	Pipeline trench excavation and backfill would cause residual soil, construction wastes and domestic wastes etc.
7	Vegetation	Vegetation can be damaged due to substations and pipelines construction.
8	Animals	As the project is located in urban settings, large wild animals are not observed or recorded. Only small rodents would be affected by construction. The impact on animals is minor.
9	Damages to roads	Most of the pipelines will be laid under roads. Trench excavation would destroy the road. Heavy truck would damage the pavement.
10	Social impacts	Daily traffic of residents will be affected by the pipeline construction under the roads. Accessibility to mosques will be affected; Congestion will happen in road sections where the pipeline is constructed in rush hour due to enclosed road and increased construction fleet; Public transport affected with reduced passengers and loss of income; Safety of students will be a concern when they are crossing the construction sites if the traffic is congested and in chaos. Commercial activities along the road sections will be affected in terms of reduced consumers and loss of income.

4.2 Impact Assessment in Operation Phase

4.2.1 Positive Impacts

The project will bring primary benefits after the project becomes operational. The main positive impacts include saving of coal, reduction of air pollution loads and CO_2 emission and improvement of air quality in the project area. Operation of the project will achieve coal saving and reduction of air pollution loads and CO_2 emitting into the air in the project area, as shown in Table 4-2 below.

Table 4-2 Reduction of Coal Consumption and Air Pollutants after the Project
Unit: ton/year

Component	Coal saved	SO2 Reduced	Total Suspended Particulates (TSP)	CO2 Reduced
Shayibake Network	154,100	8,201	3,175	325,600
Shuimogou Network	122,200	6,254	2,329	258,200
Total	276,300	14,455	5,504	583,800

The ambient air quality in the project area will be improved after the project, as predicted by EA process, see Table 4-3 below.

Table 4-3 Ambient Air Quality Improvement by the Project

Item		Before the project	After the Project	Class II of Air Quality Standard
Annual days when API≤100 (day)		262	273	-
Average air pollutants concentration in heating season	SO2(mg/m3)	0.159	0.100	0.060
	NO2(mg/m3)	0.085	0.070	0.080
	PM10(mg/m3)	0.202	0.050	0.100

Note: API≤100 means "Good"

4.2.2 Negative Impacts

Potential adverse environmental impacts during the operation phase of the project mainly come from substations, as summarized in Table 4-2.

Table 4-4 Impacts during the Operation of the Project

No.	Issue	Negative impacts
1	Wastewater	Backwash wastewater from substations. According to analogical analysis of monitoring data of wastewater discharged from existing urban community with heat exchangers, the concentrations of pollution factors are as follows: pH 8.1, SS 44mg/L, BOD5 4.55 mg/L and CODcr 22.5 mg/L. The wastewater quality meets the "Discharge Standard for Municipal Wastewater" (CJ3082-1999).
2	Noise	Substations have potential influence on surrounding sensitive points, especially hospitals and schools. The area within a radius of 40 m from the substations would be affected. The period will last from Oct. 15th to Apr. 15 of the next year.
3	Domestic solid waste	Domestic solid waste will come from pressure-isolation stations and substations. Improper disposal of domestic solid waste would lead to breeding of mosquitoes and flies, odor and diseases.

4	Risk	Pipeline explosion would lead to leakage of hot water that flows into green belts and damage the vegetation and ecological environment.

4.3 Indirect impacts from Closure of Small Boilers

As a result of the project implementation, Component A (Shuimogou network) will replace the use of 53 small coal fired boilers, while Component B (Shayibake network) replace 87 coal fired boilers. The survey conducted by the EA team found that among these 140 small boilers, about 97 of them contain asbestos, accounting for nearly 70%. Most of these boilers belong to other owners than the project entity.

Most of these to be closed boilers will be demolished sooner or later as per local government's requirement. Environmental impacts caused by boiler dismantlement mainly include: dust in the construction phase caused by the dismantlement of boiler equipment and chimney and cleaning and transporting soils; wastes like broken bricks and rubble and old boiler equipment generated in the process of site cleaning. If they are not disposed in time, visual appearance would be influenced. Air-borne dust would be caused in windy and dry days.

Asbestos, used for insulation purpose to prevent heal losses of boilers, is listed in the "National Hazardous Waste Inventory", the type is HW36 and its code is 900-032-36. Asbestos materials will be unpackaged during small boiler dismantling. The dismantling activities, if not carried out very carefully, could result in asbestos fibers release and float in the air for a long time. If inhaled by human, asbestos may accumulate in human bodies for years and damage lung cells which would increase the risk of development of lung cancer. Although asbestos is definitely identified as a carcinogen, it would only damage human health when its concentration in the air reaches a significantly high level. The impact of asbestos can be controlled with good management measures, such as proper storage, It is kept intact, stored properly, handle with caution and disposed in a way to minimize breakup.

5. DUE DELIGENCE REVIEW OF ASSOCIATED FACILITIES AND PROJECT ACTIVITIES IN 2010

5.1 Heating Sources

Two existing CHP plants and three peak load boiler houses will supply heat to the heating networks of the project. As part of the World Bank requirements, due diligence review of these associated facilities has been conducted by EA team and included in the environmental assessment.

The Current status and progress of the heat sources are shown in Table 5-1.

Table 5-1 Heating Sources Related to the Project

Heating network	Heat source	Progress	Tech. process	Treatment of smoke
Shayibake Network	Hongyanchi CHP (2×330MW)	Under operation partly since Sep. 2010	Coal-fired pulverized boilers for power and heat generation	Wet lime scrubbing for desulphurization and electrostatic precipitator (ESP) for de-dusting. Online monitoring of particulates, SO2 etc connected to the Xinjiang EPB.
	Shiyue HOB (5×29MW hot water boiler)	Under operation since 2000	Coal-fired, some fluidized-bed and others chain boilers.	Semi-dry lime or double-alkali for desulfurization, strengthen ESP or water scrubbing for de-dusting. Online monitoring connected to Xinjiang EPB.
	Lanzhu HOB (4×29MW+1 ×64MW	Under operation since 2000	Ibid	Ibid
Shuimogou Network	Weihuliang-III CHP (2×330MW)	operated since Nov. 2009	Coal-fired pulverized boilers for power and heat generation	Wet lime scrubbing for desulphurization and ESP for de-dusting. Online monitoring of particulates SO2 etc connected to Xinjiang EPB.
	Hualing HOB (6×29MW+2 ×58MW hot water boiler)	Retrofitted three times since operation in 1996.	Coal-fired, some fluidized-bed and some chain boilers.	Semi-dry lime or double-alkali for desulfurization, strengthen ESP or water scrubbing for de-dusting. Online monitoring connected to Xinjiang EPB.

According to the "Notice about Air Pollution Control of Corporations including Xinjiang Xinlian Thermal Co. Ltd. within a Time Limit" (Wuzhengtong[2010]No.29) promulgated on March. 29th 2010, smaller boilers with air pollutant emissions exceeding Xinjiang's local "Emission Standard of Air Pollutants for Coal-fired Boiler" (DB65/2154-2010 have been required to be merged into the 20 existing corporations that are required to control the air emissions within2010. The main air pollutants like SO_2 and particulates should meet the local emission standards (viz. SO_2 150 mg/m^3 and dust 50mg/m^3). Shiyue, Lanzhu and Hualing peak load Boiler Plants are all included in the list of 20.

5.2 Emissions and Discharges of Heat Sources

(1) Air pollutants

Retrofitting of peak load boilers for the project networks has all completed by end of 2010. Updated dedusting and FGD equipment has been under operation since

October 2010. As compared in Table 5-2, the local standard of Xinjiang (DB65/2154-2010) is the most stringent one. After the retrofitting, air pollutant emissions of three peak load boiler plants and two CHP plants that supply heat to the heating network of this project meet all of these standards. The air emissions of heat sources (Data of Nov and Dec 2010) are presented in Table 5-3.

Table 5-2 Comparison of Relevant Standards

Air Pollutants	WB's EHS guidelines for thermal power plant	National Emission standard for thermal power plants (GB13223-2003)	National Emission Standard for Coal-fired Boiler (GB13271-2001)	Urumqi Emission Standard for Coal-fired Boiler (DB65/2154-2010)
SO_2	400	400	900	150
NO_x	200	450	\	\
Dust	30	50	200	30

Table 5-3 Air Emissions from Heat Sources (Data of Nov and Dec 2010)

Heating network	Heating sources	Dust (mg/m^3)	SO_2 (mg/m^3)	NOx (mg/m^3)	Compliance with all four standards
Shayibake	Hongyanchi CHP	28	123	178	YES
	Shiyue HOB	28.3	113	NA	YES
	Lanzhu HOB	23	143	NA	YES
Shuimogou	Weihuliang III CHP	27	49	154	YES
	Hualing HOB	25.3	942	NA	YES

(2) Water pollutants

The waste water from the CHP plants and the peak load boiler plants is discharged into civil sewer network. The monitoring results of wastewater show that it met the Grade III standards (for discharged into municipal sewer system) in "Integrated Wastewater Discharge Standard" (GB8978-1996).

(3) Solid waste

Main solid wastes of the thermal power plant and the peak load boiler plants are slag, coal ash and wastes generated from desulphurization. They are mainly (more than 70%) utilized as construction material or raw materials for production of construction materials. The rest is transported and disposed in landfills.

In conclusion, the environmental performance of these heat sources in terms of air emission, water pollution and solid waste management meets relevant requirements in China and of the WB.

5.3 Review of Project Activities Completed in 2010

In order for the construction work undertaken during 2010 before the project

appraisal to be eligible as part of the project under counter-part funding, a due diligence review is required by the Bank to see if it meets the Bank's requirements on safeguard. The EA team reviewed both the existing EA documents (domestic EAs prepared by another EA institute and already approved by Urumqi EPB) and their implementation on the ground during 2010 construction season April-October. Findings from the review are presented in a separate environmental due diligence report of 2010 project activities. A heat regulation station is under construction on municipal hilly land with one hectare and another will be built in an existing state owned boiler station.

The conclusion of the due diligence review is that project activities in 2010 have met the Bank's requirements on environmental safeguard. Good practices from the 2010 construction program will be continued during project implementation, such as distribution to affected residents a bilingual convenience booklet (in Chinese and Uyghur) about construction activities, schedule, and alternative routes. The review also identified some gaps in 2010 activities and made suggestions for improvement which have been incorporated in the final EMP.

Since the pipeline will be installed along existing city roads, the road maintenance will be undertaken by Urumqi municipality.

6. ANALYSIS OF ALTERNATIVES

6.1 Comparison of 'With' and 'Without' project

During project development, various alternatives have been screened and compared with technical, economic and environmental criteria. In terms of the environmental assessment of alternatives, the primary objective was to identify and adopt options with the least adverse environmental impacts. The evaluation and comparison has included the scenario of with and without the project. Since the project will replace small heat boilers with district heating supplied by CHP plants equipped with advanced emission control devices, a net positive environmental benefit is anticipated compared to the without project scenario.

The following criteria formed the basis of identifying the most appropriate options for the project: i) Meet the required standard with the least cost option; ii) Being appropriate in respect of local conditions; and iii) Being proven in operation at or close to the scale proposed.

6.2 Alternatives of Heating Technologies

The pros and cons of the alternative heating technologies are listed in Table 6-1.

Table 6-1 Comparison of Alternative Heating Technologies

No.	Technology Options	Pros	Cons
1	Heating by decentralized coal-fired boilers	Low capital and operation cost; Easy management and maintenance	Boilers need to be built in urban areas. Pollution sources are dispersed, hard to control and not cost-effective. Energy efficiency is the lowest.

2	Centralized heating by large coal-fired boilers	Large-scale boilers with higher energy efficiency; Better techniques can be adopted to flue gas control	The boilers and lots of pipeline need to be built in urban areas. Flue gas control is not very cost-effective.
3	Centralized heating by CHP	Energy efficiency is highest. Air pollutant emission per unit heating area is lowest. The scale effect makes flue gas control more economical. Easier to meet standards. CHP can be built outside the built up areas.	Capital and operating costs are high. Higher management requirement

Option 3 was considered to be the preferred and most cost-effective option and in compliance with the relevant emission standard.

6.3 Alternatives of Heating Fuels

Two heating fuel options were considered and compared based on the above criteria, coal and natural gas. Given the existing coal-based energy structure of Urumqi, natural gas accounts for only 3.7% of primary energy consumption. The gap of gas supply in summer and winter are 0.2 million m^3 and 1 million m^3 respectively. In order to guarantee gas supply for domestic use (i.e. cooking), the supply of gas for industrial production has to be sacrificed.

The city plans to increase the share of natural gas in heating to 33.3% in the medium term. It is promoting the use of natural gas heated boilers where district heating network cannot be extended. In future, conversion of coal-fired peak load boilers to natural gas is also preferred due to environmental consideration. However, security and stability in supply and affordability of natural gas must be addressed first. The project will create condition for such conversion in future by constructing an integrated district heating system with much fewer heat sources which can easily switch fuel in future. So in this stage, coal was preferred.

7. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

7.1 Information Disclosure

In accordance with the requirements of the China's EA Law and the World Bank, there were two rounds of information disclosure, with the first round being posting brief information of the two physical components in main streets and residential areas during the field investigation. It was also posted in the internet and local newspapers. The second information disclosure was carried out after the draft EIA reports were completed. Main impacts and measures and the environmental management plan (EMP) were announced in local media with links to full version of the EIA reports. The details are in Table 7-1.

Table 7-1 Information Disclosure

Round	Activities	Location	Time
1st	Notice of EIA for the UDHP Public Participation notice of EIA	-Bulletin boards at communities, residential areas and schools in the project region -Website of the Urumqi EPB: http://www.wlmqhb.gov.cn -Xinsilu Website: http://www.xj163.cn Urumqi Evening News	27/01-28/02/2010 02/03-12/03/2010 03/03-10/03/2010 02/03/2010
2nd	EIA Completion Notice and main contents Full EIA reports	-Website of the UMEPB -Xinsilu Website: http://www.xj163.cn -Urumqi Evening News	08/04-18/04/2010 08/04-18/04/2010 21/04/2010

In addition, the draft EIA report and other project related information have been placed in the Urumqi International Technology Cooperation Project Office for Heating Supply Reform and Building Energy Saving and the EA Center of the Xinjiang Uyghur Autonomous Region.

7.2 Public Consultation

In accordance with the requirements of the China's EA Law and the World Bank, two rounds of public consultation were conducted by the EIA team. The first round focused on environmental screening to define public concerns, to assist identification of key environmental issues and to draw public response and comments on the initially developed mitigation measures for the potential adverse impacts identified before EA TOR finalization. The second round was designed to ensure public awareness of the EA effort and final project definition and mitigation by presenting a draft EA report to the public through information disclosure procedures. Details of the two rounds of public consultation undertaken are presented in Table 7-2.

Table 7-2 Implementation of the Public Consultation

Round	Timing	Participants	Form	Organizer
1	Jan 27 -Feb. 28, 2010	People from sensitive receptors and interested individuals	Questionnaires, interview and public meeting	Urumqi International Technology Cooperation Project Office for Heating Supply Reform and Building Energy Saving and the EA Center of the Xinjiang Uyghur Autonomous Region.
2	April. 5 - May 20, 2010	People from sensitive receptors and interested individuals	Questionnaires, interview and public meeting	

8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 Institutional Arrangement and Supervision Mechanism

The institutional arrangement and responsibilities of relevant agencies and organizations for environmental management are as follows:

Urumqi International Technology Cooperation Project Office for Heating Supply Reform and Building Energy Saving (UITCPO) serves as the Project Management Office (PMO) and is responsible for supervising the implementation of the EMP;

Urumqi District Heating Company (UDHC) as the executing unit and the project owner will take the ultimate responsibility for environmental management including engaging environmental supervisors and monitoring agencies;

Engineering Supervisors, to be engaged by UDHC, will be responsible for supervising the day to day EMP implementation and environmental management during construction, recording the effectiveness of the mitigation measures and any problems in the monthly supervision reports. .

Contractors will be responsible for implementing the mitigation measures in construction phase.

External monitors (usually local Monitoring Stations) to be engaged by UDHC will undertake environmental monitoring according to the monitoring plan in the EMP during the project construction and operations.

Urumqi Municipal Environmental Protection Bureau (EPB) will be responsible for enforcement of environmental regulations and standards, particularly the environmental compliance of those associated facilities and activities.

8.2 Mitigation Measures

Mitigation measures for the potential impacts in the construction and operation phases are summarized in Table 8-1. The cost for implementing these measures will be covered by respective implementers as indicated in the Table 8-1.

8.3 Environmental Monitoring Plan

An environmental monitoring plan has been developed for both the construction and operation phases in the EMP, which includes the monitoring location, monitoring parameters, methods, frequency and cost estimate. The parameters to be monitored during construction are dust and noise, and air quality (Dust and SO2) and noise during operation. The total cost estimate for the environmental monitoring is RMB 17,400 since monitoring during operation phase will mostly use the city's routine monitoring by Urumqi EPB.

8.4 Environmental training plan and reporting

The objectives of the environmental training are to make major parties involved familiar with the EMP and national and local environmental requirements about the construction and operation of heating network so that the EMP and other measures could be implemented. The UDHC is responsible for organizing environmental experts to provide training before the construction. An environmental training plan will be undertaken for staff from the above organizations with total budget being estimated at 240,000 RMB. Training course contents will include relevant

regulations, the project EMP and mitigation measures, construction code related to EHS and handling of to environmental incidents.

The PMO will be responsible for collecting environmental supervision and monitoring reports and prepare the semi-annual Monitoring and Evaluation (M&E) report about the EMP implementation to the World Bank. The " M&E Report for EMP implementation" could include the following:

EMP implementation status: measures and their effectiveness, training progress;

Environmental monitoring: main results, any problems and their causes.

Any environmental complaint, the causes analyzed, solutions and the public satisfaction will be recorded and included in the report.

- Action plan for the next half year, including measures to correct problems found.

Table 8-1 Major impacts and Mitigation Measures

Issue	Mitigation measures	Implementer	Supervisor
Construction phase			
Air-borne Dust	Water spray is required near the residential areas. It shall be conducted twice to three times per day in order to reduce impacts of air-borne dust on residents; Powder materials like cements should be carefully covered or bagged. Unpackaged transport of such materials is forbidden.. It should be covered by tarp when stored; Construction shall be well managed. The machinery should be maintained, repaired and operated properly to reduce air pollutant emissions during the construction; and Fences should be installed around construction site and the pile yards of construction materials.	Contractors	UITCPO, Urumqi EPB
Noise	Low-noise equipment or noise reduction and isolation device shall be used; Temporary noise isolation structure or sound barriers are needed at the construction sites where key sensitive noise receptors are identified; The machinery should be maintained, repaired and operated properly to reduce noise; Construction should be stopped at night (10 p.m.– 8 a.m.);; The construction at sections where schools are located is forbidden during examinations; and Workers should be provide with personal protective equipment, e.g. helmet and earplug, etc.	Contractors	UITCPO, Urumqi EPB
Waste water	Wastewater should not be discharged into the surface water. Improper disposal of pollutants should be prevented. In particular, oil leak from machines into the water must be prevented. Irrigation channel and culverts should be kept clear April-Oct.	Contractors	UITCPO, Urumqi EPB

Issue	Mitigation measures	Implementer	Supervisor
Solid waste	Spoil shall be transported to the Urumqi Construction Residual Yard or where earthwork is needed. The construction waste shall be piled at designated sites by "Administration Measures of Urumqi on Urban Construction Waste" and transported to the operating Urumqi Construction Waste Landfill. The domestic waste shall be piled at designated sites and transported to Urumqi Landfill every day.	Contractors	UITCPO, Urumqi EPB
Chance-find	The construction should be stopped immediately once any physical cultural relics are discovered and should report to the local Cultural and Religion department and specialists; The site should be protected by the contractor until the local cultural department issued a permit.	Contractors	UITCPO, Urumqi EPB
Social Impacts	Full preparation and coordination before the construction; Properly arrange construction schedule to avoid rush hour, Half road enclosure where appropriate; Good safety measures: Bilingual booklet about construction schedule and alternative exit distributed to neighborhoods, bilingual warning signs erected at construction sites. Sidewalks to be provided where pedestrian traffic is busy. Warning signs, fence and crosswalk on the road sections near schools etc; and respect and keep enough exits for religious activities in mosques nearby. A Traffic Management Plan has been developed and annexed to the EA/EMP; Roads should be restored immediately after the works on the section is completed. A Resettlement Policy Framework has been developed and will be used in case of a need for land acquisition and/or resettlement caused by modification of pipeline alignment.	Contractors	UITCPO, Urumqi EPB
Operation phase			
Noise	High-quality low-noise pumps shall be used. The sound level per pump should not be over 80 dB(A). Vibration reduction for base and shock absorber shall be installed. Pump inlet and outlet shall be connected with rubber hose. Concrete base shall be built under the pump. Vibration reduction should be installed between the base and the floor or walls to eliminate impacts of low-frequency noise due to the structure.	UDHC	Urumqi EPB

Issue	Mitigation measures	Implementer	Supervisor
Wastewater	can be discharged into the municipal sewers directly	UDHC	Urumqi EPB
Wastes	The domestic waste shall be piled at designated sites and transported to the Urumqi Landfill every day.	UDHC	Urumqi EPB
Risk	Periodical check should be carried out so that potential risks could be detected in time. Threats of possible pipeline damage or broken to the environment and safety could be avoid. Emergency plan for pipeline damage and broken should be proposed.	UDHC	Urumqi Construction Committee and EPB

8.5 Closure Plan for Small Boiler

Since most of these small boilers are beyond the control of the PMO and UDHC, their closure and demolition will need to be overseen by the third party. According to the domestic institutional arrangement in China and that in Urumqi, namely the "Circular about Approving and Forwarding the 'Implementation Plan for Urumqi CHP Network Integration' " (Wuzhengban [2010] No.127), boiler closure and dismantlement are mainly Urumqi's each district governments and district EPBs. Municipal government and EPB as well as the concerned district governments and EPBs will be responsible for supervising and monitoring the demolition process to ensure it is conducted in environmentally sound manner and that any hazardous wastes (e.g. asbestos) from demolition are handled and disposed of properly.

To help with the proper dismantlement of the boilers, the closure plan was developed during EA preparation with mitigation measures for boiler dismantlement listed in Table 8.2. The booklets titled "The Damage and Disposal of Asbestos" were delivered to the construction units by the UITCPO in order to enhance the awareness of construction units and the owners of boilers.

Table 8.2 Mitigation Measures for Boiler Dismantlement

Key activities	Main impacts	Mitigation measure	Implemented by	Supervised by
Construction dust	on ambient air quality & surrounding residents' living	Water spray on site is required. It shall be conducted twice-three times per day. The machinery should be maintained, repaired and operated properly. Barriers should be installed around the pile yards of construction materials.	Owners of small boilers	Urumqi EPB
Site cleaning	Impacts on visual appearance	The construction wastes shall be piled at designated sites and transported to the operating Urumqi Construction Waste Landfill. Old boilers should be collected and transported by certified institution.	Owners of small boilers	Urumqi EPB
Disposal of asbestos	Asbestos fiber may lead to cancer if it is inhaled in human body.	The protective equipment for workers must be provided. Warning signs should be set at the construction sites. Watering must be carried out during the unpacking process. The dismantlement workers should wear dust masks and protective cloth. Detailed program shall be prepared. Integral peeling should be carried out. Safety barriers should be installed around the working sites. Entrancing is prohibited.	Owners of small boilers	Urumqi EPB

		Designated professionals are responsible for directing on-site works. The dismantled asbestos shall be collected in sealed bags and then stored in special cement sealed cans. Finally, the cans should be sealed with cement. The cans with asbestos shall be transported to Urumqi Hazardous Waste Landfill. It should be disposed with deep and permanent burying. A contract should be signed to ensure the effective disposal.		

8.6 Management plans to address social impacts

The project entity contracted an experienced local social to conduct social analysis to the project area. Through broad participations of project stakeholders, project information dissemination, public consultations, interviews, focus group of discussions, and quantity of data information analysis, the social analysis concluded that there will not be direct impacts to land acquisition and structure demolition caused by Bank supported project and the all communities fully supported the project. The social analysis also prioritized the stakeholders concerns that were identified as indirect impacts, were concentrated on three major issues. Those issues were suggested to be minimized or mitigated as the disturbance to city traffic during project civil work, workers in small closure boilers that might be dismantled during the project implementation or later and heating price influence to the vulnerable families. It is important to ensure the success in the project program of small boiler closure and the avoidance of enterprise workers' income reduction, the avoidance of the influence to vulnerable families, and the enhancement of city traffic management and emergency management (i.e. in the unlikely event of water pipeline break, a cut in electricity during pipeline installation) during project construction period. Based on the informative social analysis, the PMO prepared the stand-alone impact analysis to the vulnerable people and the monitoring plan, the monitoring plan for the workers in the closure boiler stations, traffic management plan, and emergency management plan.

Traffic Management Plan

This Bank supported second levels of heating transferring pipeline will be constructed along main city roads with about 55 km in two districts in Urumqi city. The construction period of each section (street block) will take one or one and half of month. It is really challengeable to manage the project well and implement the targeted tasks on time. The earthwork could be only carried out in half of a year from April to October since the earthworks are restricted by cold weather in winter season and interrupted by rainy summer season. The project management plan takes mitigation measures to enhance the project management and the earthwork implementation. However, citizens were experienced in the daily traffic facts and had their concerns to the traffic disturbances. In order to manage a better project from different perspectives, the project authority contracted an experienced local social consulting team to conduct the social analysis by participatory approaches in 41 engaged urban communities and prepared a traffic management plan and monitoring plan to the traffic management. The project authority will assign full-

time staff to be the executive manager in the field as the head of monitoring team. This team will be grouped in the construction sites by local social specialists, representatives of the communities/schools/mosques/hospitals/owners of shops/enterprises, local traffic policemen and volunteers in the districts. The sections of the constructed roads will be sealed by fences and notices including the project information, hot-line, supervisors and contractors, will be pasted on. The social specialists will collect the information from daily traffic, citizens complains and report to the project authority and the project leading group consisting of executive Major and Head of municipal traffic management office. A quarterly traffic monitoring report will be sent to the Bank.

For emergency matters as in the unlikely event of water pipeline break, a cut in electricity during pipeline installation, any citizen could call to the project leading group. The hot line and booklets will be disseminated in each community and pasted on the community information walls.

Monitoring plan for workers affected by small closure boilers

The concerns of the workers affected by small boiler disclosure were addressed by the project authority. A monitoring plan was prepared to monitoring the implementation of municipal policy that indicates zero laid-off workers if the factories/enterprises are closed down by reasons. The monitoring teams will be grouped by local social specialist, representatives of the workers in the small boilers and the staff from the project authority. Yearly monitoring will be reported to the Bank and their findings would be reported directly to the project authority even upper to the project leading group.

Heating assistance plan to low income families

Based on the information analyzed by the local social team, some of the low income families did not pay much attentions to the heating price increase since Urumqi launched a program to support the low income families with the policy of no extra charge to those families for years, but some of the low income families were getting worried to the heating price and the negative change of the municipal policy. The project authority prepared a monitoring plan as heating assistance plan to low income families. The monitoring team will consist of local social specialist, the representatives of the communities/low income families and staff from project entity. Yearly monitoring report focusing on no extra charge to those low income families will be sent to the Bank and project entity. Urumqi municipality will afford to the increase of the heating price through municipal budget as it is implemented currently.

9. CONCLUSIONS

Urumqi City has been suffering severe air pollution in winter season, mainly caused by intensive use of coal in industrial sector and space heating sector. The smaller district heating networks and coal-fired stoves with low energy efficiency and poor flue gas control contribute a large share of the air pollution loads in winter;

This project fits well into the Urban Heating Plan for the improvement of district heating service in the city while helping with improving environmental performance of the service, and creating condition for fuel conversion from coal to natural gas in future;

The benefits of the project are large. It will reduce the consumption of coal by 276,300 t/a, cut the SO_2 emission by 14,455 tons, particulates load by 5,504 tons and CO_2 load by 583,800 tons each year. Although this project alone cannot resolve the air pollution problem, it will contribute to achieving the objective;

The project will also cause some moderate adverse impacts to the environment. During the construction phase, dust, noise, solid waste, safety of pedestrians, traffic blocking, etc., during the operation phase, noise, wastewater, domestic waste and pipeline leakage risk will be primary concerns. With careful design and implementation of mitigation measures as specified in the environmental management plan, these adverse impacts can be mitigated to minimal level.